Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. A store can sell 12 tablets for $200 each. The manager estimates that for each $10 price reduction she can sell 2 more tablets per day. Each tablet costs the store $80. Let x be the number of $10 price reductions.

   (a) Write equations for the price and the quantity of tablets sold:

   $p(x) =$

   $q(x) =$

   (b) Write equation for the cost, the revenue and the profit functions:

   $C(x) =$

   $R(x) =$

   $P(x) =$

   (c) What price should the manager set to maximize the store's profit?

2. Use implicit differentiation to find $\dfrac{dy}{dx}$ if

$$2xy^2 - 3x^2y = y^2 - 2.$$

3. A soldier is standing 12m away from a helicopter on a vertical take off whose ascending speed is 1.4 m/sec. Find how fast the distance between the soldier and the helicopter is changing when the helicopter is at a height of 5m from the ground.
(**Hint**: Recall the Pythagorean Theorem from Geometry.)
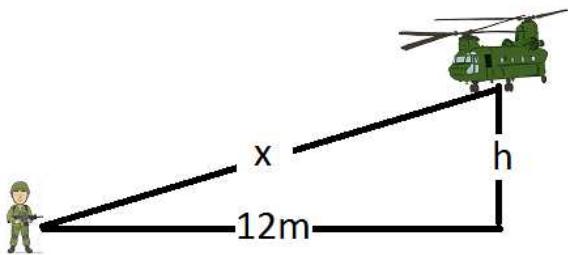
4. Solve the following equations:

   (a)
   $$\frac{2^{(x^2)}}{16} = 32^{x-2}.$$

   (b)
   $$\log x + \log (x - 10) = 3 \log 2 + \log 3.$$

5. The population $P(t)$ of a certain species in an ecosystem t years after beginning its tracking is given by
$$P(t) = 100(27 - 7e^{-0.2t}).$$

   (a) How many individuals were in the population initially?

   (b) When will the population reach the level of 2500 individuals?